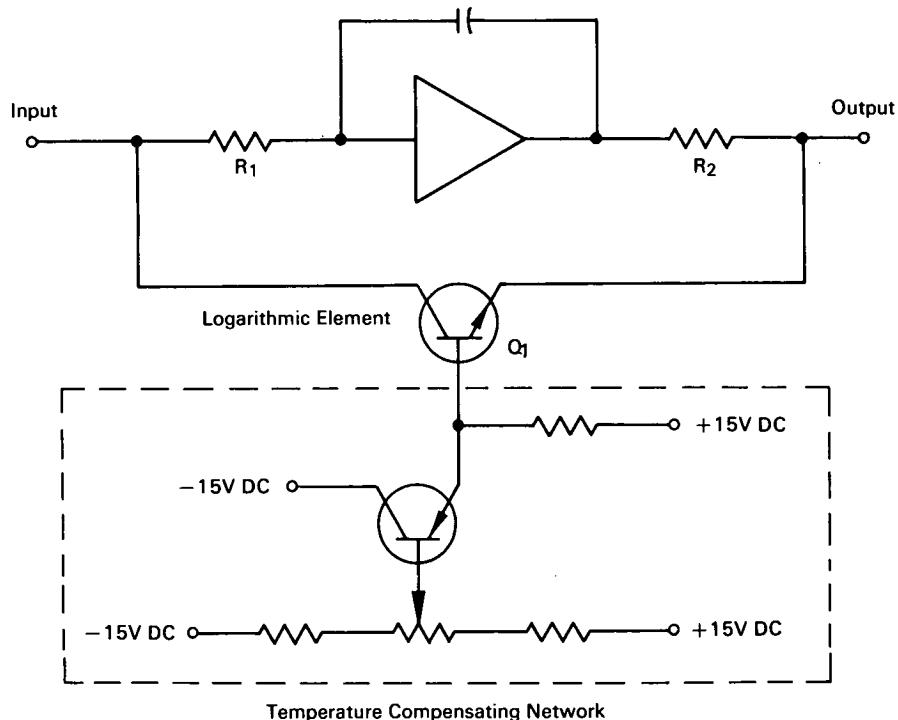


## NASA TECH BRIEF



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### Transistor Circuit Increases Range of Logarithmic Current Amplifier



#### The problem:

To design a logarithmic current amplifier capable of operating throughout a range of  $10^{-12}$  to  $10^{-2}$  amperes. Amplification through this range can be obtained by cascading amplifiers in incremental steps but this creates problems of physical volume, reliability, calibration, and difficult operation.

#### The solution:

A circuit that provides logarithmic amplification of an input range from  $10^{-12}$  to  $10^{-2}$  amperes by combining a commercially available amplifier with a silicon epitaxial transistor.

#### How it's done:

The principle of operation involves the placement of a logarithmic feedback element across the amplifier. The circuit operates on the transfer function of the silicon epitaxial transistor,  $Q_1$  in which the output voltage is proportional to the log of the input current. Resistors  $R_1$  and  $R_2$  and the capacitor stabilize the circuit. That portion of the circuit within the dotted lines serves only to provide temperature compensation for  $Q_1$ . Input impedance is 10 megohms and input signal strength is  $10^{-12}$  to  $10^{-2}$  amperes.

(continued overleaf)

**Note:**

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
AEC-NASA Space Nuclear Propulsion  
Office  
U.S. Atomic Energy Commission  
Washington, D.C. 20545  
Reference: B66-10350

**Patent status:**

No patent action is contemplated by NASA.

Source: G. Gilmour  
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